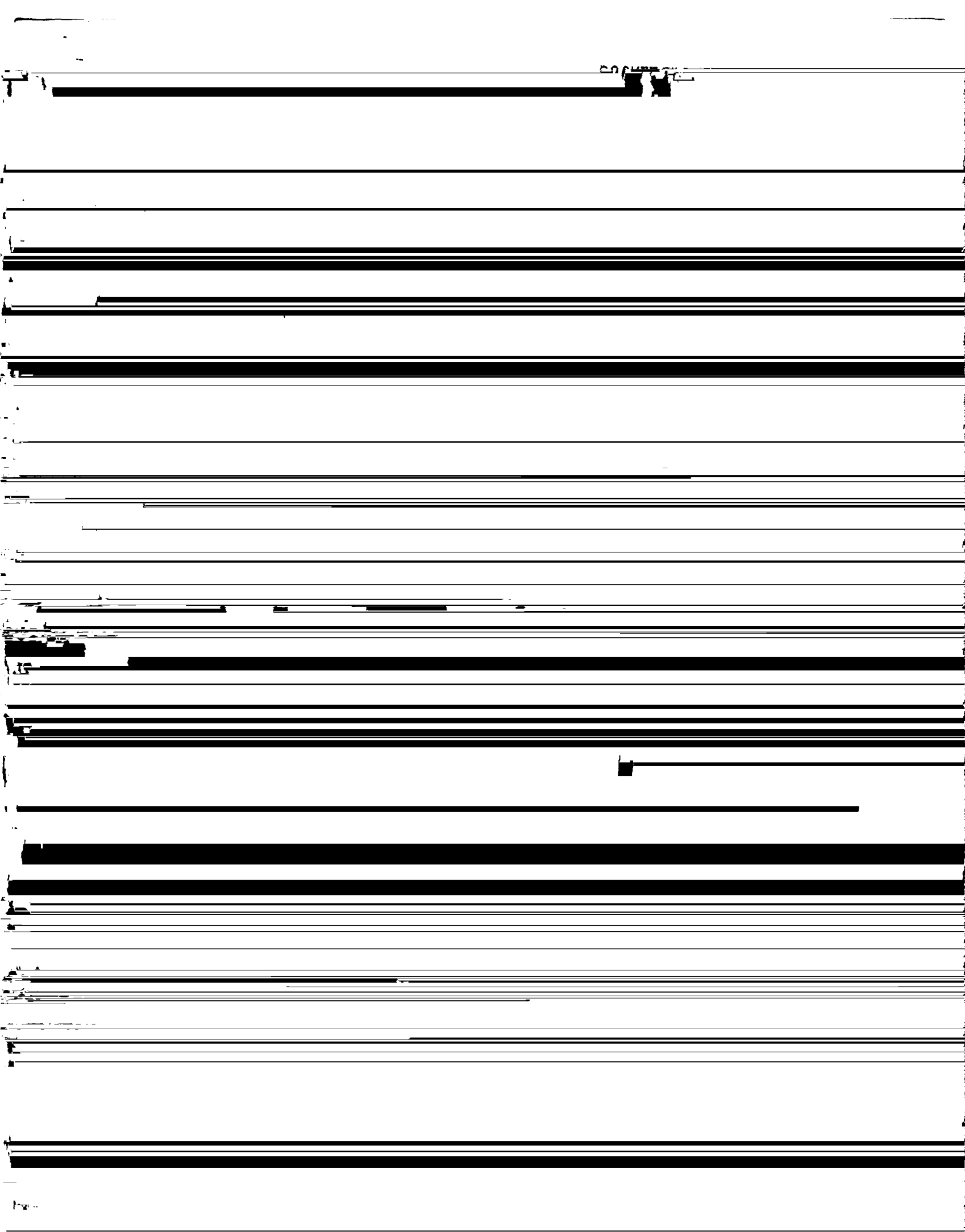

TABLE OF CONTENTS

SUMMARY

APCO supports the concept of "spectrum refarming" as it will help to alleviate (but will not solve) serious current and future spectrum shortages facing state and local government public safety agencies. The Commission's proposal, however, moves too quickly and takes several wrong turns in its search for rules to achieve more efficient use of the radio spectrum.

APCO proposes an alternative plan that includes a reduction in channel bandwidth over a ten year period to 12.5 kHz for both VHF and UHF land mobile frequencies. The plan will allow for, but not yet mandate, further channel reductions as narrowband technology is developed. This approach will (1) provide a much smoother migration to narrowband technology than the Commission's proposal, (2) create short-term spectrum relief in especially congested urban areas, (3) allow licensees to amortize fully their current equipment, (4) prevent premature adoption of untested technology and standards that will diminish the effectiveness of public safety communications, and (5) is consistent with the precedent setting work of APCO Project 25.

APCO also urges the Commission to abandon its proposed HAAT based power and height limitations which would severely reduce signal penetration and require many state and local governments to expend millions of dollars to add transmitter sites. As an alternative, APCO suggests that public safety frequency coordinators be allowed to limit a public safety agency's transmitter coverage to that which is necessary to provide a specified signal strength at the agency's jurisdictional boundary.

The Commission offers two proposals for partial or complete consolidation of the public safety radio services. APCO urges that if the current services are retained, any newly created channels must remain in the same radio service, with band-edge channels assigned to the Local Government Radio Service in which all public safety users are eligible. If the Commission chooses to consolidate the public safety radio services, APCO urges that there be a single public safety frequency coordinator. Multiple coordinators for the same radio service is not cost-effective, would unnecessarily complicate and slow down the frequency coordination process, and, most importantly, would reduce the effectiveness and quality of frequency coordination. The result would be inefficient spectrum use and, potentially, destructive interference between critical public safety communications systems.

BEFORE THE

Federal Communications Commission

WASHINGTON, D. C. 20554

In the Matter of	)	
	)	
Replacement of Part 90 by	)	
Part 88 to Revise the Private	)	PR Docket 92-235
Land Mobile Radio Services and	)	
Modify the Policies Governing	)	
Them	)	

To: The Commission

COMMENTS OF APCO

The Associated Public-Safety Communications Officers, Inc. ("APCO"), hereby submits the following comments in response to the Commission's Notice of Proposed Rulemaking in the above-captioned proceeding, FCC 92-469, released November 6, 1992.

STATEMENT OF INTEREST

APCO is the nation's oldest and largest public safety communications organization representing the interests of all elements of the public safety land mobile radio community. APCO has nearly 10,000 members involved in the management and operation of radio communications systems for police, fire, state and local government, emergency medical, forestry conservation, highway maintenance, and other public safety services. APCO is the FCC-certified Frequency Coordinator for all Part 90 Police, Local Government and 420 MHz and 800 MHz Public Safety channels.

Of particular relevance to this proceeding is APCO's Project 25, which has been developing interoperability

standards for digital public safety radio equipment, which will also be suitable for use in other land mobile portions of the spectrum. Project 25 is a joint project of APCO, the National Association of State Telecommunications Directors

public safety radio communications operations, impose undue financial burdens on state and local governments, and, this in turn would threaten the safety of life and property. Therefore, APCO has suggested alternative proposals that will provide for significant improvements in spectrum efficiency without the negative effects of the Commission's proposal.

Many of APCO's concerns with respect to the Commission's spectrum refarming proposal relate to the special needs and requirements of public safety land mobile radio communications. Some of APCO's concerns may not apply to non-public safety radio services, and some of APCO's alternative proposals may be inappropriate for other users. Therefore, the Commission should establish separate land mobile radio regulations for public safety where necessary and feasible. In particular, separate rules addressing height/power limitations and frequency coordination matters could be fashioned without any significant impact on non-public safety users. APCO recognizes, however, that uniform rules regarding channel bandwidth and related equipment issues would be mutually beneficial to all land mobile radio users and manufacturers.

Uniform channel bandwidths and equipment commonality is critical to all private radio services. The key to maintaining low prices and providing a wide variety of equipment to all users is the economy of scale that can be achieved by common channeling and equipment parameters

(channel access, modulation, bandwidth, common air interface, etc.). APCO cannot overstate the importance of standardization to the maximum extent possible. To do otherwise would generate niche markets causing equipment to be prohibitively expensive, if even available, for many users.

A. Public Safety Agencies Face Serious Spectrum Shortages.

Carefully planned spectrum refarming over a reasonable time frame is needed to help alleviate serious radio spectrum shortages facing public safety users, though such efforts will never be a complete substitute for additional radio spectrum allocations. Growth in population and population density and the resulting infrastructure demands, including increases in crime, danger from hazardous wastes and forest fires, expanded emergency medical needs, and other factors have placed greater demand on public safety agencies and their communications operations. At the same time, budget constraints have stretched manpower and facilities, requiring increased reliance on radio communications.

New technologies that are or soon will be available will also require additional spectrum capacity. These technologies include the ability to transmit fingerprints, maps, criminal records, video, building diagrams and similar data to public safety personnel in the field. As described below, special efforts must be made to insure that spectrum

refarming efforts, such as channel splitting, will not preclude the advancement of such new technologies, several of which will require wider, not narrower, channel bandwidths.

Eight years ago, the Private Radio Bureau completed a study estimating that between 12.5 MHz and 44.6 MHz of additional public safety radio spectrum would be needed in the 21 largest metropolitan areas by the year 2000, even assuming the use of advanced spectrum efficient technology.[1/] In spite of this study, the Commission has since allocated just 6 MHz nationwide for public safety (and an additional 6 MHz for the especially congested Los Angeles area). Even had the Commission allocated all of the spectrum specified in the PRB study, there would still be shortages as the study underestimated actual public safety needs. The study projected that, by 1992, there would be

spectrum relief. However, refarming alone is not enough. There must also be additional spectrum allocations to meet the current and future demands of state and local government public safety agencies. This spectrum could come from reallocated Federal spectrum, newly allocated spectrum for emerging technologies, and from other services that should also be subject to spectrum refarming.

There is no reason why public safety land mobile users should be forced to dramatically reduce their spectrum use while other users of the radio spectrum (such as television broadcasters) not only continue to make inefficient use of a large block of spectrum, but are actually seeking more spectrum for unproven commercial services. Spectrum refarming must apply to all uses of the radio spectrum. There is a real potential for obtaining channels for public safety use from some of the other services without hardship or a detrimental effect on those services. In a number of instances exchanges could be made which would result in a mutual benefit to all concerned.

B. The FCC's Refarming Proposal Poses Serious Concerns for Public Safety.

The Commission's Notice was a well-intended, but flawed, attempt to develop a mechanism for improving spectrum efficiency as quickly as possible. Unfortunately, many of the most critical proposals in the Notice are based on serious misconceptions of (1) the operational needs of public safety and other private radio users, (2) the

restrictions of current and near-term technology, (3) the costs imposed on users, and (4) the potential disruption of current communications systems, especially those that are used for the protection of life and property.

APCO's specific objections to the proposals in the Notice were set forth in a document submitted to the Commission on December 15, 1992, and a letter to the Chief of the Private Radio Bureau, dated January 12, 1993, and have been the subject of APCO's presentations at the Commission's two spectrum refarming panel discussions. As stated in its January 12 letter, the following are APCO's basic objections to the Notice:

- Loss of contiguous public safety spectrum to other services in the 150 - 160 MHz band.

- Interleaving of non-public safety services with those of public safety in certain portions of the spectrum, thus destroying the integrity of public safety block allocations. Interleaving also prevents grouping of channels to support other wider bandwidth technologies such as TDMA and high

- An offset channel plan that would essentially make all existing equipment obsolete, due to incompatible synthesizers.

- Power limitations based on HAAT and ERP that will unnecessarily force state and local governments to spend millions of dollars to build new transmitter sites, and in some instances actually preclude effective systems due to unavailability of additional usable sites.

- Unrealistic reduction of modulation to 3 kHz.

- Potential loss of many or most of the mobile relay station assignments presently operating in the 150/160 MHz band. The Commission proposal makes no provision for mobile relay assignments in this band. Further, the proposed channel assignments are not conducive to mobile relays due to a lack of standard pairing and the problem of intermodulation products from the high number of new channels. In addition, the proposed low power restrictions would essentially preclude mobile relay operation on those channels so designated.

- Lack of a migration plan which would provide near term relief and maintain interoperability, while

at the same time be capable of developing into long term spectrum efficiency.

- Elimination of discrete block allocations and establishment of multiple frequency coordinators for Public Safety channels.

These Comments will elaborate on those objections, while also expanding upon APCO's previously submitted alternative spectrum refarming proposal (contained in its January 12 letter) which it believes will achieve the Commission's spectrum-efficiency goals with considerably less disruption and cost to public safety communications systems.[4/]

On May 6, 1993, the Commission issued a Public Notice of the filing of alternative spectrum refarming proposals by the Land Mobile Communications Council ("LMCC"), of which APCO is a member, and the National Association of Business and Educational Radio ("NABER"). APCO participated in the development of LMCC's "Consensus Plan," which is consistent with APCO's proposals.[5/] APCO also believes that some

---

[4/] One change from APCO's January 12, 1993, proposal is that APCO no longer recommends a requirement that existing systems reduce modulation deviation to 4 kHz. Subsequent studies indicate that there would be little if any benefit to such a reduction.

[5/] On one key issue, a migration plan for the 150-170 MHz band, LMCC could not reach consensus and instead submitted two options (designated A and B). As described below, APCO supports LMCC's Option A. APCO will also (continued...)

aspects of NABER's "White Paper" are worthy of consideration, in particular it comments that bandwidth is not the only measurement of spectrum efficiency.

II. THE FCC'S PROPOSED SPECTRUM EFFICIENCY STANDARDS MUST BE MODIFIED FOR ALL LAND MOBILE RADIO SERVICES.

A. BASIC CONSIDERATIONS

The core of the Commission's spectrum refarming proposal is its proposed spectrum efficiency standards, the principal focus of which is reducing channel bandwidth. However, spectrum efficiency standards should not be considered only in the light of channel bandwidth. An equally important consideration is the amount and quality of information that can be passed in a given length of time over a specified amount of spectrum. The standard must also reflect the cost and disruption of its implementation and respect the limits of technology.

The Commission should consider the method of transmission, as well as the bandwidth over which that transmission occurs. There must be an opportunity for the development of all types communications technologies, including, but not limited to, FDMA (both analog and digital), digital technologies such as TDMA, and narrowband

---

[5/] (...continued)
address several significant issues not discussed in the LMCC proposal.

technologies (both analog and digital).[6/] Channel splitting, while an apparent immediate approach, must be accomplished in a manner that does not impair the degree or quality of communications or force adoption of a single methodology.

Care must also be exercised in any plan that channels are not made so narrow that they preclude or inhibit the development of new technologies that may require wider bandwidth, but will provide services that will offer vastly improved public safety communications. For example, there must be ample channel width to accommodate high speed data, facsimile, video and other technologies on the horizon.

The special communications needs of public safety users also need to be considered. Public safety requires a significantly higher grade of service than many other private land mobile radio services. For example, the tactical needs of public safety agencies require a very high degree of voice recognition to allow for instantaneous identification of personnel in rapidly developing emergency situations. Efficiency standards must not diminish voice recognition or other elements of the current high grade of service provided.

[6/] APCO believes that the use of CDMA will be limited in the PLMR bands because relatively unused spectrum with wider bandwidths is required for CDMA to be effectively implemented. Further, the feasibility of developing equivalent systems, such as mobile relay operation, using CDMA, has not been fully demonstrated.

The imposition of spectrum efficiency standards must also take into consideration the cost of new equipment necessary to meet that standard, and allow users to amortize fully their current equipment before being forced to replace it. This is particularly important for public safety users who typically operate on extremely limited budgets and are often forced to maximize the useful life of their radio

Finally, a spectrum efficiency standard must accurately reflect state of the art technology, with reasonable

they presently appear in Part 90, and each division is made by dividing each channel in the center. APCO considered an offset plan, but concluded that a far more graceful migration can be achieved by retention of existing center frequencies. This is precisely the methodology used in the NPSPAC 800 MHz plans and is providing excellent results and spectrum efficiency. As equipment is upgraded, geographic separation can be reduced or entirely eliminated.

The APCO proposal for the 450-512 MHz band is as follows:

PHASE 1

- Adopt 12.5 kHz as the standard channel bandwidth for all new licenses in PLMR Services no later than 12 months following the adoption of the Report and Order.

- Adopt standards for frequency stability for all new equipment manufactured after a specified time following the adoption of the Report and Order, which will ensure containment within the specified bandwidth. These standards will depend upon the channelizing scheme which is adopted.

- Adopt an emission mask proposal that will govern various modulation types (i.e., FM digital, ACSB etc.). This mask must result in adjacent channel interference protection levels that ensure reuse of adjacent 12.5 kHz channels in the same geographic area.

Detailed technical analysis of the various techniques must be made before a final decision is reached in this regard.

- To facilitate near term effectiveness, power and channel band width requirements should be initiated at the end of the 12 month time period following adoption of the Report and Order.

- All new systems or systems where major modifications or expansions are made should be required to meet the frequency stability and emission mask requirements for transmitters no later than 24 months after the Report and Order is adopted. It is unrealistic to expect complete equipment changeout whenever new frequencies are added to a system. For example, a large agency should not be expected to changeout all equipment to meet new standards if it is adding one new channel to a 10-channel system with over a thousand units in

spurious harmonics must be grandfathered at appropriate power levels until the current equipment is replaced. All current users must convert to equipment meeting the new standards ten years after the adoption of the Report and Order, or accept secondary status. This will allow recently acquired wide band equipment to be amortized over a full ten-year period.

Low powered (2 watt limitation) simplex, mobile relay and link stations licensed to the Public Safety Radio Services in the 450-470 MHz bands on 12.5 kHz offset channels perform critical public safety functions. APCO proposes to permit high power operation on the 12.5 kHz offsets in the 460-470 MHz band, requiring all low-powered users to remain secondary or move to the 450-460 band where low powered stations will ultimately have primary status on the 12.5 kHz offsets. This choice was made because the 450-460 MHz band is currently shared among all safety services, and use of the 12.5 kHz offsets is very heavy, whereas the 460-470 MHz band has relatively small channel blocks assigned to Police, Fire, and Emergency Medical Services with very little present 12.5 kHz secondary use. Therefore APCO suggests the following:

- Remove the low power restrictions on all 12.5 kHz offset Public Safety Service channels in the 460-470

after adoption of the Report and Order, provided all new equipment installed on these channels meets the 12.5 kHz parameters as stated, and as the systems can be coordinated with users on 25 kHz channels who may still be using 25 kHz equipment. Continue to permit low power (2 watt) operation on a secondary basis as at present.

- Licensees operating at full power on 12.5 kHz offset channels in the 470-512 MHz band pursuant to waivers should be grandfathered, and new full power operation on 12.5 kHz offsets should be permitted 12 months after the effective date of the Report and Order, consistent with technical parameters discussed above.

- Retain low power restrictions on all 12.5 kHz Public Safety Service channels in the 450-460 MHz band, giving them primary status 12 months after adoption of the Report and Order, provided all new equipment installed on these channels meets the 12.5 kHz parameters as stated. Existing 25 kHz equipment can continue to operate on a secondary, non-interference basis to other systems.

PHASE 2

- Further divide all 450-512 channels to 6.25 kHz no later than the year 2000. Permit assignment of these channels on a primary basis as soon as equipment is developed which will provide for adjacent channel operation in the same geographical area. Allow assignment of contiguous channels for TDMA provided a satisfactory demonstration of equal spectrum efficiency is made.

- At a distant point, perhaps by the year 2014 (as proposed by LMCC), require all licensees to convert to 6.25 kHz bandwidth channels. This is the minimum recommended by major manufacturers as providing sufficient bandwidth to support a 9.6 kHz channel bit rate.[1/] However, a determination to adopt 6.25 kHz would be premature at this point. Instead, the Commission should plan to revisit the issue by the end of this decade.

C. REFARMING THE 150-174 MHz BAND

In this band, the Commission proposes a radical plan to require all new systems licensed after 1994 to use 5 kHz

---

[1/] Project 25 has determined that 9.6 kb/s is currently the minimum usable data rate for digital public safety radios to ensure the required high grade of service and to provide for future technological developments. This includes 4.8 kb/s for the vocoder, 2.4 kb/s for control and features, and 2.4 kb/s for error detection and correction.

channels, and to force current users to convert to 15 kHz equipment by 1996, and 5 kHz equipment as early as 2004.

operation, (f) the manner in which all channels have been utilized with little regard for mobile only restrictions, (g) the fact that many systems have been built with output power and antenna heights far in excess of actual needs, and (h) present interference problems, due to intermodulation, desensitization and lack of spectrum.

Unfortunately, the Commission's proposal will exacerbate, not resolve these problems. Among APCO's objections to the proposal are (a) the 5 kHz channel width which virtually precludes all methods and techniques except single sideband, narrowband and linear modulation, which have yet to be proven in the public safety land mobile environment, (b) the loss of public safety spectrum to non-public safety entities, (c) the dissolution of service blocks as they now exist, (d) the removal of all frequency specific limitations, such as "State Only", "mutual Aid" etc., (e) the designation of many channels for low power use only, (f) the lack of any attempt to create usable mobile relay channels in this VHF High Band region, (g) reduction of deviation to 3 kHz which will degrade signal to noise ratio and lower system performance in other ways, including use of CTCSS and use of alert signaling tones, (h) the short time frames proposed for conversion which would obsolete existing systems and equipment long before amortization, and (i) the failure to consider the entire 150-160 MHz spectrum in the refarming effort, including services other than in Private Land Mobile Radio.

APCO has suggested an alternative proposal for the 150-170 MHz band similar to its 450-470 MHz plan and to LMCC's Option A, i.e., adopt 12.5 kHz as the standard bandwidth within 12 months of the effective date of the Report and Order, and require licensees to use 12.5 kHz equipment 10 years after that effective date. While the Commission should establish a band plan that anticipates a possible further division to 6.25 kHz in the early part of the next century, it would be premature to adopt 6.25 kHz as the final bandwidth until it is demonstrated that such narrow band equipment is available and can accommodate the special needs of public safety users.

The Commission should adopt frequency stability and emission mask requirements in a similar manner as proposed for the UHF bands. Power and coverage restrictions identical with that proposed for the UHF portion of the spectrum should be mandated within the same time frame. While existing systems must be grandfathered for as much as ten years, the new parameters should apply to all new systems and major system modifications or expansions.

A principal advantage of this 12.5 kHz proposal is that it is consistent with the Federal spectrum refarming efforts, providing both Federal and non-Federal users with the benefits of lower cost equipment because of economies of scale experienced by manufacturers. Moreover, common bandwidths will facilitate interoperability between Federal and non-Federal public safety users, which is becoming